



**US Army Corps
of Engineers**

SBAS-A: SBAS for ArcView Application - Update

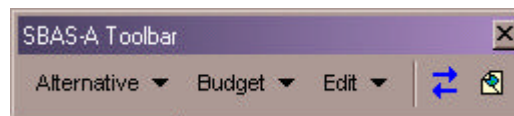
By Rose Dopsovic

GETTING STARTED:

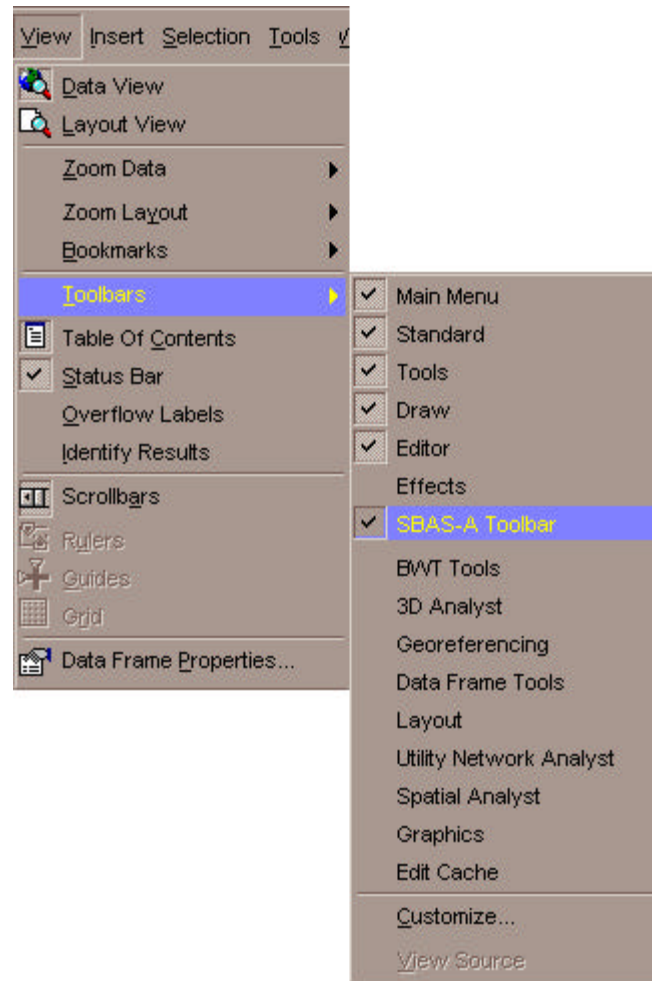
SBAS-A has been designed exclusively for use in ESRI's ArcMap© environment of ArcView 8©. It is integrated directly into the ArcGIS© Desktop via a customized toolbar. This custom application is available for download from Coastal Hydraulics Lab's website, <http://chl.wes.army.mil> or <http://gis.sam.usace.army.mil>.

Installation Instructions:

1. Download the SBAS-A setup file (setup.exe) from the Coastal Hydraulics Lab's website.
2. Double-click on setup.exe and follow the on-screen instructions for installation of SBAS-A (version 1.2 into the ArcMap© environment.
3. Open the ArcMap© application. The SBAS-A toolbar will appear as a floating toolbar in the display. This toolbar can be mounted by dragging and dropping it on any existing toolbar. If at any time after installation this toolbar is not visible, it can be activated by selecting the SBAS-A Toolbar option in the Toolbars item in the View menu.



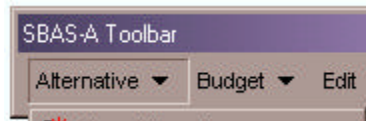
SBAS-A Toolbar



Accessing the SBAS-A Toolbar. If "SBAS-A Toolbar" is not visible in the list, the SBAS-A installation files have not been setup correctly.

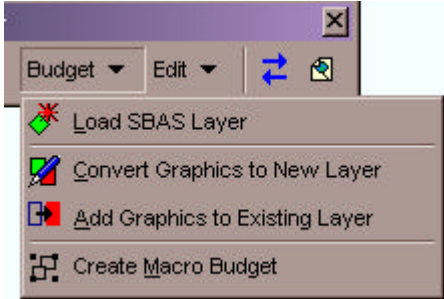
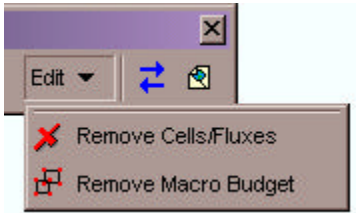


Toolbar Description:

Alternative Menu



New Alternative: Simply creates a new instance of an alternative

Load Project Alternative: This tool allows the user to Save and Load Alternative files (*.sbd). Users MUST load the Alternative file that is associated with the Sediment Budget shapefiles before editing an existing Sediment Budget.

Budget Menu		
		
<p>Load SBAS Layer: Allows the user to browse to a SBAS layer. This tool will automatically load the associated Alternative file for this layer.</p> <p>Convert Graphics to New Layer: This tool allows the user to create a new Alternative and/or convert graphics in the display into Littoral Cells or Flux Arrows data layers.</p> <p>Add Graphics to Existing Layer: Users can add additional cells or fluxes to existing Sediment Budget layers. Using the selected graphic(s) in the display, this tool converts the graphic(s) into the selected layer.</p> <p>Create Macro Budget: A macro budget can be created as a new layer, when a user draws a polygon (with Draw Rectangle or Draw Polygon tool) around a micro budget. This tool automatically calculates a total residual for all cells residing in the macro budget polygon.</p>		
Edit Menu		
		
<p>Remove Cells/Fluxes: This tool will <u>only</u> be activated if an Edit Session has been started. This tool deletes the selected feature of the active layer in the table of contents and removes the feature from the Alternative.</p> <p>Remove Macro Budget: This tool releases cells from the Macro Budget. If individual cell needs to be edited, it first must be removed from the Macro Budget.</p>		
	Change Direction of Flux Arrow	An Edit Session <u>must</u> be started to enable this tool. This tool changes the direction of the selected flux arrow and updates the sediment budget with the new values.
	Edit Cell or Flux Values	Using the selected feature of the active layer in the table of contents, this tool provides an interface to enter cell and flux values.

Definition of Terms:

Alternative: An Alternative represents one set of assumed conditions for a particular sediment budget. Each Alternative has its own set of fluxes, cells, placements, and removals.

Attribute Table: A table used to store attribute information for a specific coverage feature class. Each row represents a feature and each column denotes a field. To view a layer's attribute table, right-click on the layer in the Table of Contents and select the "Open Attribute Table" option.

y-directions to locate x,y positions of point, line, and area features.


A reference system consisting of a set of points, lines, and/or surfaces, and set of rules used to define the positions of points in space either in two or three dimensions.

Shapefile: A vector data storage format for storing the location, shape, and attributes of geographic features. A shapefile is stored in a set of related files and contains one feature class.

Table of Contents: In ArcMap®, the Table of Contents lists all the data frames and layers on the map, and shows what features the symbols in each layer represents.

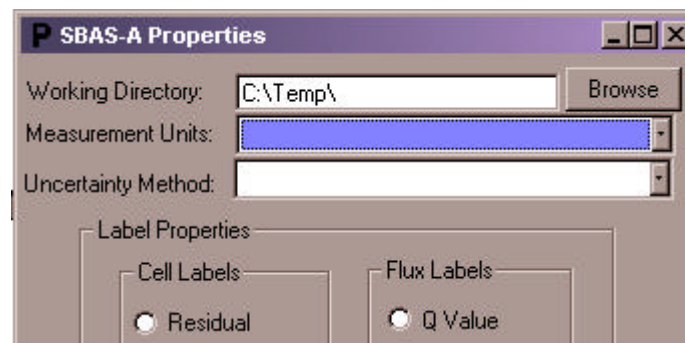
Working Directory: The directory where all shapefiles created during an SBAS-A are stored.

APPLYING SBAS-A:

The SBAS-A application allows users to take advantage of the standard spatial tools inherent in a GIS environment. Before beginning the development of a Sediment Budget, users should add pertinent datasets into the data frame to assist in the analysis and design of the budget. Vector, raster and tabular data can all be added using the “Add Data” tool. 

Many types of data will be used in the creation of a sediment budget and can be easily stored in the GIS environment. Fluxes into and out of sediment budget cells may be in the form of numerical model output, or of actual data collected during field studies. The change in volume for cells can be derived from varying types of data and GIS tools. For example, volume change between successive SHOALS or other bathymetric data sets may be computed directly in the GIS environment. Volume change may also be derived from comparisons of successive beach profiles or shoreline change data.

Once the initial basemap data has been added into the view, users can begin to use the tools available in SBAS-A. First, preferences should be set to determine some basic elements of the Sediment Budget. Selecting the **Set Preferences** option, from the **Alternative Menu** can access the dialog box as shown below.

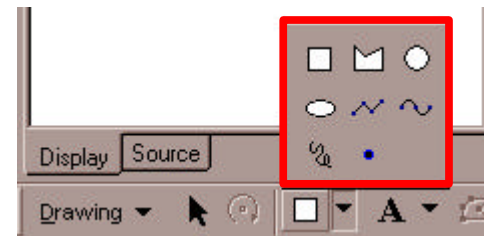
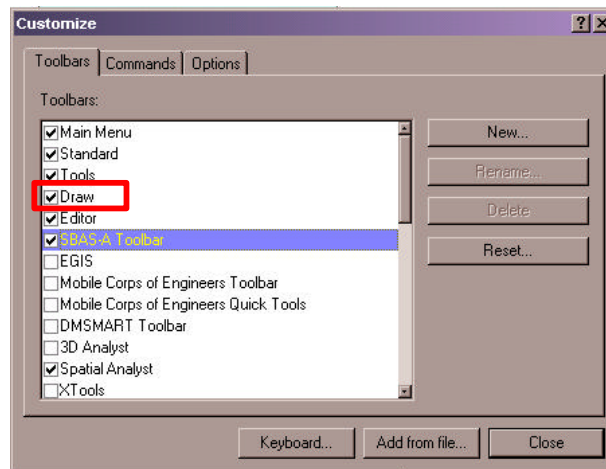


A session. Once the “Apply” button is clicked, the changes will take effect.

Creating Cell and Flux Layers

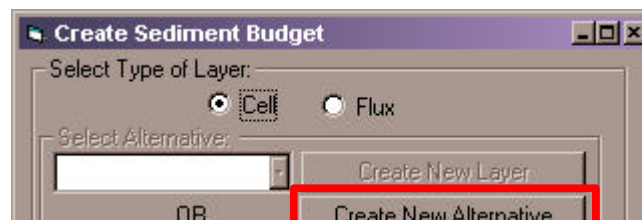
The structure of the sediment budget is now ready to be created. Using the “Draw Rectangle” and “Draw Polygon” tools located on the **Draw Toolbar*** of ArcMap, littoral cells can be placed in data frame. To draw simple, rectangular cells, select the “Draw Rectangle” tool and click where the upper right boundary of the littoral cell should reside; then drag to the lower right boundary. When the mouse button is released, a rectangle will be displayed in the frame. To draw irregular shaped cells, select the “Draw Polygon” tool and click to represent each vertices of the polygon. Double-click to finish drawing the cell. Once all cells are drawn for the budget, a Sediment Budget layer can be created. If cells need to be added at a later point, they can be done so with the “Add Graphic to Layer” Tool.

*To turn on the Draw Toolbar in ArcMap, from the Tools menu, select Customize. Click to check in front of the “Draw” Option.



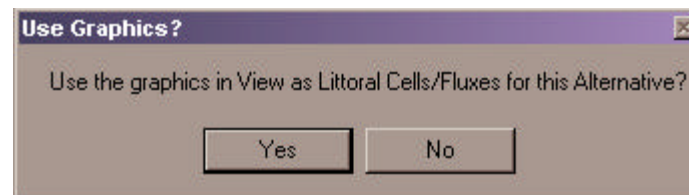
Draw Toolbar with Drawing tools highlighted.

Sediment Budget layers can be created from graphics using the “Create Sediment Budget” tool. To convert a littoral cell graphic into a layer, select “Cell” for the type of layer. If no alternatives are loaded or no alternatives exist, the dialog will appear as below.

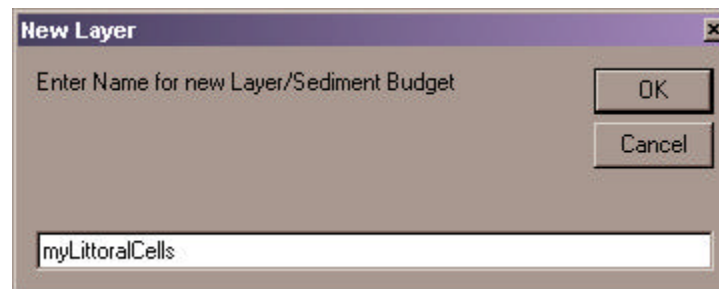




Enter in Name and Click OK.



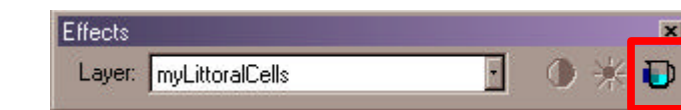
Select Yes to convert the graphics in the view into a layer.



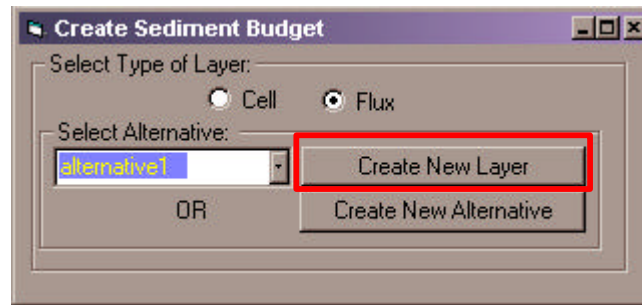
Enter name for new layer.

This layer will be stored in the working directory location set in SBAS-A Preferences.

All graphics in the view are now converted into a layer in the Table of Contents. Setting the color and label options can be done by editing the properties of the layer. To edit these values, right-click on the layer name and select "Properties". By default, when a littoral cell layer is created all residual values are set to zero. Therefore, all the cell colors remain the same until cell or flux values are edited. Also, the littoral cells have an opaque fill and any data layer beneath the cells cannot be seen. To change the fill of the layer, transparency can be set. To change the transparency for a layer in the Table of Contents, first turn on the "Effects" toolbar. The Effects toolbar can be turned on by selecting the Customize option from the **Tools Menu** then click to check in front of "Effects".




Use this tool to set level of transparency.



Creating a new Flux layer within an existing alternative.

To add the flux lines to the current alternative, select the alternative name from the combination box on the "Create Sediment Budget" dialog; then select the "Create New Layer" button to convert the graphic lines and name the flux layer. Once the layer is added into the Table of Contents, the lines are transformed into arrows denoting sink and source values.

Changing the Direction of the Flux

The direction of an arrow can be changed at any time by first starting an Edit Session (from the Editor Toolbar, select Edit, Start Editing), then highlight the flux layer in the Table of Contents, and selecting a flux arrow, and clicking "Change Direction of Flux Arrow" tool. 

Note: The Flip Flux tool will remain disabled until an Edit Session is started. Once the session is started, the user will be able to change the direction of the flux polylines.

Editing Cell and Flux Values

The selected layer in the Table of Contents and the feature selection of this layer determine the values to be edited when the SBAS-A "Edit Tool" is selected. From the SBAS-A toolbar, select the Edit Tool, and then select a feature (cell or flux) to edit. Be sure to select the same feature, as the type highlighted in the Table of Contents.

If a cell layer is selected in the Table of Contents and has a littoral cell selection the following datasheet will display when the "Edit Tool" is clicked:

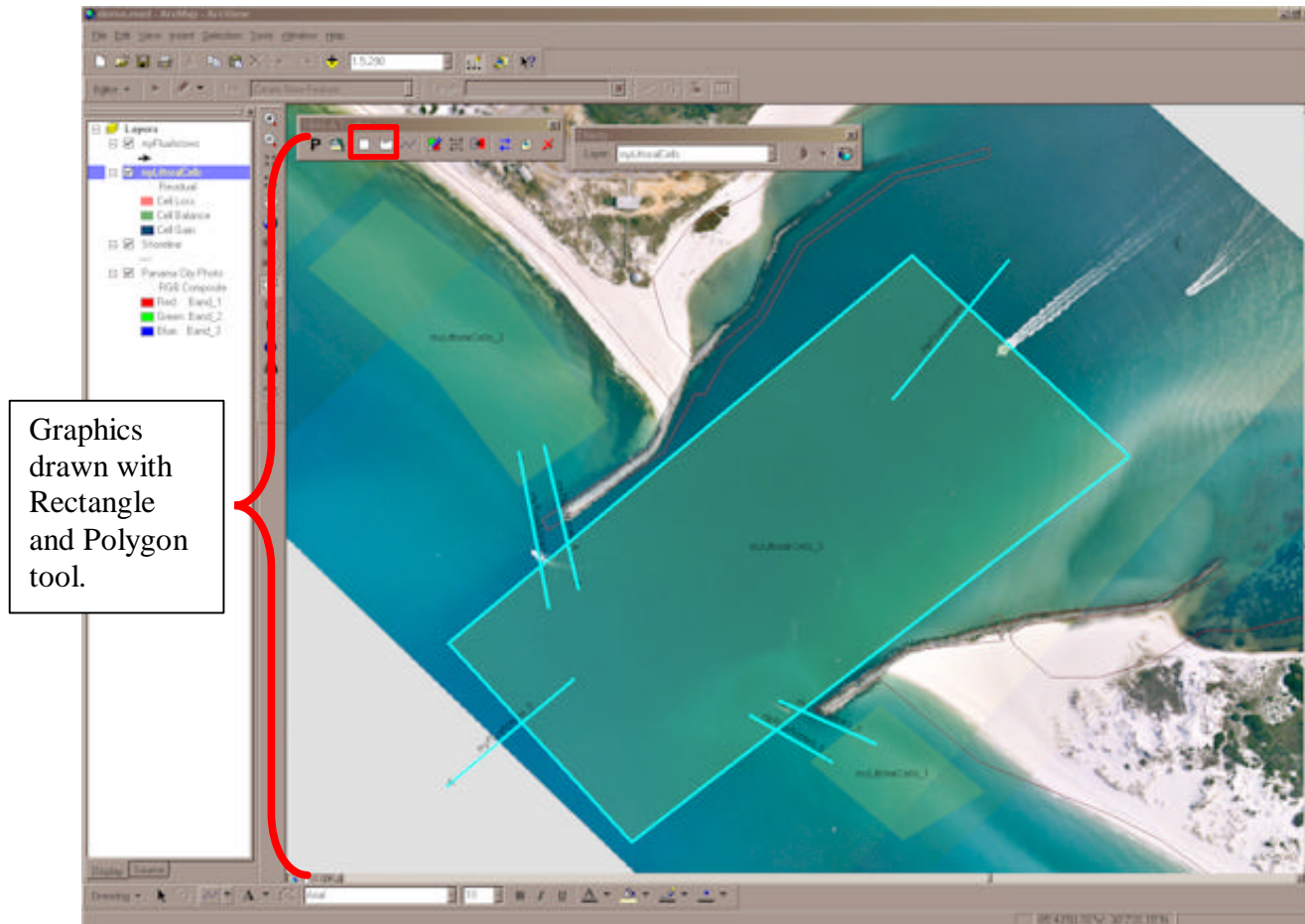
Cell Properties					
LittoralCells_1			Units:cu m/yr		
Variable	Value	Uncertainty	Locked	Shared With	Notes
SOURCE FLUXES					
FluxArrows_1	0.00	0.00	<input type="checkbox"/>	LittoralCells_3	
SINK FLUXES					
FluxArrows_2	0.00	0.00	<input type="checkbox"/>	LittoralCells_3	
dV	0.00	0.00	<input type="checkbox"/>	N/A	

attribute table in the Residual field.

If a flux layer is selected in the Table of Contents and has a flux arrow selection, the following tabbed form will display when the "Edit Tool" is clicked:

The image displays two side-by-side screenshots of the 'Flux Properties' dialog box. The left screenshot shows the 'Flux Values' tab, which contains the following fields: 'Name' (FluxArrow_), 'Value' (0), 'Uncertainty' (0), and a 'Locked' checkbox. The right screenshot shows the 'Dependencies' tab, which contains four radio button options: 'None' (selected), 'Calculate Q due to relative sea-level rise', 'Calculate Q due to on- or off-shore transport', and 'Define equation (dependency on other Q's)'. Both screenshots include 'OK', 'Cancel', 'Apply', and 'Help' buttons at the bottom.

Data entry forms for editing flux values. Click Apply to save value changes. When values are entered and the Apply button is clicked, the value per flux is posted in the layer's attribute table in the Qvalue field.



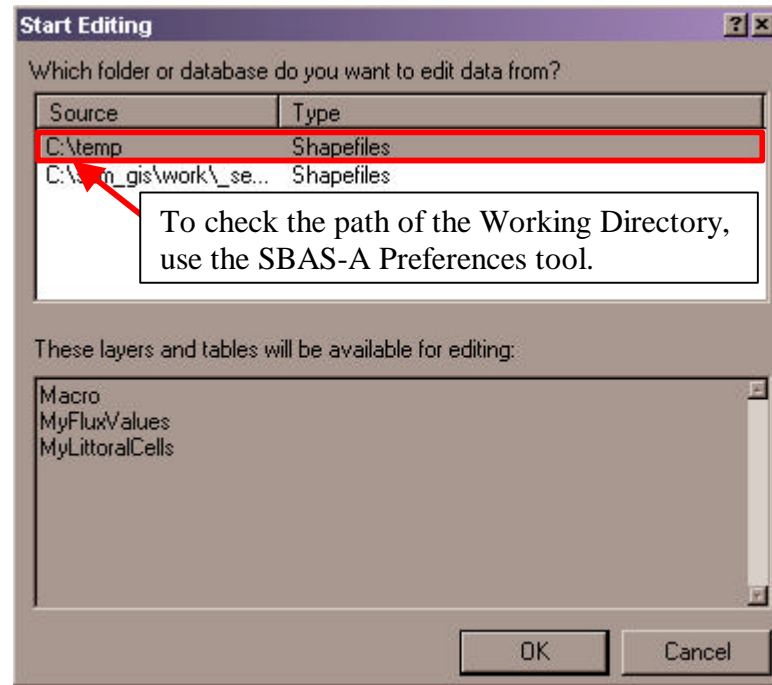
Data frame once graphics have been converted into a spatial layer and transparency has been set for the littoral cell layer.

Editing Feature Layer

When editing the Sediment Budget, additional cells and fluxes may need to be added to the schematic. To add these items to an existing layer, either draw graphic polygons (for littoral cells) or polylines (for flux arrows) with the drawing toolset. Select the graphics, using the SHIFT key to select more than one graphic. Then, using the "Add Graphics to Layer" tool, select the type of graphic and then the target layer.




for the "Editor" toolbar and choose "Start Editing". Below is a sample of the dialog that appears. Select your working directory from the list and click OK.



From the "Editor" toolbar, change the Task to "Extend/Trim Features" and set you target layer to the layer in need of reshaping. Once these settings are in place, use the "Edit" tool from the "Editor" toolbar to move or resize the dimensions of the target layer. To save changes to the layer, select the "Stop Editing" option from the "Editor" menu. When prompted, select "Yes" to save the changes.



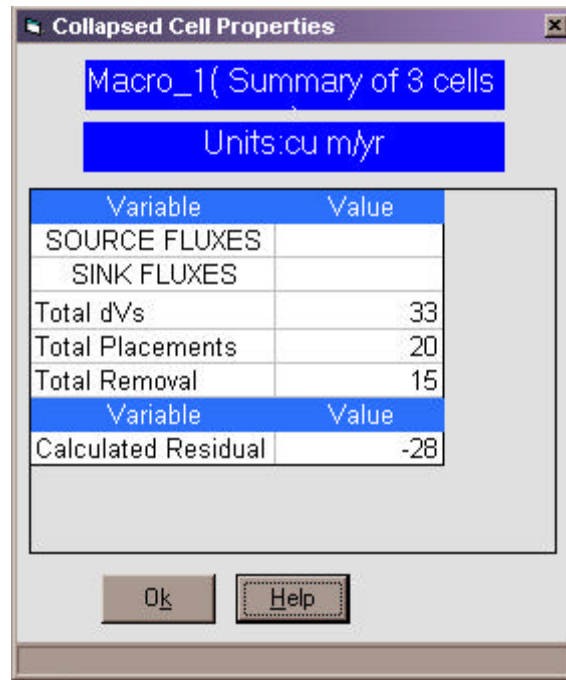
Editor Toolbar with the Edit Tool highlighted.

To completely remove a selected flux or cell from a Sediment Budget layer, select the layer in the Table of Contents and click the "Delete Selected Features" tool from the SBAS-A toolbar. 

Creating a Macro Budget

Now that the Sediment Budget has been represented by littoral cells and fluxes, a macro budget can be created to represent this budget on a large scale. Using the drawing tools, draw a polygon around the Sediment Budget area to be included in the macro budget.






The image shows a dialog box titled "Collapsed Cell Properties". It contains a text field with "Macro_1(Summary of 3 cells" and another with "Units:cu m/yr". Below these is a table with two columns: "Variable" and "Value". The table lists "SOURCE FLUXES", "SINK FLUXES", "Total dVs" (33), "Total Placements" (20), and "Total Removal" (15). Below this table is another table with "Variable" and "Value" columns, showing "Calculated Residual" as -28. At the bottom are "Ok" and "Help" buttons.

Variable	Value
SOURCE FLUXES	
SINK FLUXES	
Total dVs	33
Total Placements	20
Total Removal	15

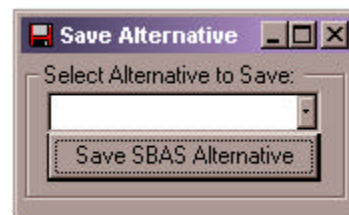
Variable	Value
Calculated Residual	-28

The Collapsed Cell Properties datasheet represents a summary of the macro budget. This datasheet can be accessed by selecting a macro budget layer in the Table of Contents that contains a macro budget cell selection; then selecting the "Edit Tool" .

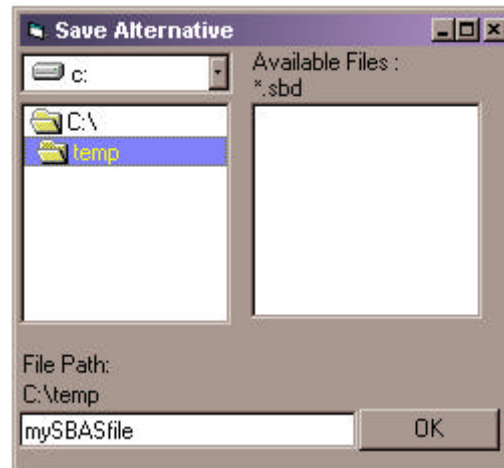
Saving SBAS-A Alternative

Saving Sediment Budget in the ArcMap© environment requires three steps.

1. Create cell and flux layers to represent the Sediment Budget with the **"Convert Graphics to New Layer"** tool.
2. Save the ArcMap© project, *.mxd, file and Alternative by selecting **Save Project/Alternative** from the SBAS-A Alternative Menu:
3. Save the Alternative. The Alternative file (*.sbd) holds all values for the sediment budget.

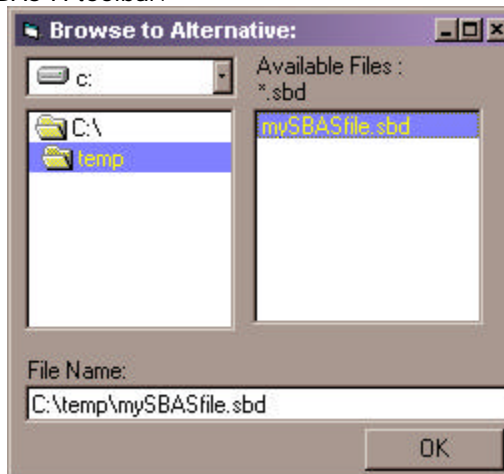


Use drop-down menu to select which Alternative to save, and click the "Save SBAS Alternative" button.



Browse to location and type in name for the SBAS-A Alternative file and click OK.

The Sediment Budget is now complete. To access this Sediment Budget during another instance of ArcMap®, the user must load particular files in order to see all values correctly. First, the saved ArcMap® project file (*.mxd) must be opened. Once opened, all sediment budget littoral cell and flux arrows should be visible. Before a user can view or edit cell or flux values, it is imperative that the associated SBAS-A Alternative file is loaded. To load the Alternative file, select the "Load Project Alternative" button from the SBAS-A toolbar.



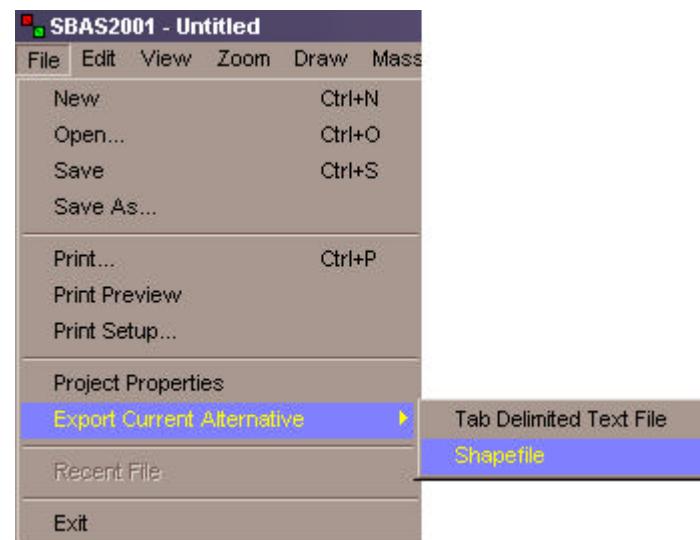
Next, browse to location of existing SBAS-A Alternative file that is associated with the Sediment Budget layers. Click OK to Load the Alternative. If the user does not remember the associated file name, the file path and name are tagged in the layer's attribute table in the SBAS_File field.

building Sediment Budgets. Some of these datasets can include georeferenced aerial photography, beach profile surveys, shoreline position data, dredging history, coastal process, bathymetry surveys, etc. Provided these datasets are in a formats that ArcMap© can translate (*.tif, *.sid, *.shp, *.lyr, etc.), all pertinent information can be added to the data frame for analysis. Users can view the data spatially in the data frame or view its attributes in its associated database file.

SBAS-A has been created exclusively for use in ESRI's ArcMap© environment of ArcView 8©. It is integrated directly into the ArcGIS© Desktop via a customized toolbar. Users of SBAS-A are encouraged to take advantage of the basic spatial tools inherent in the GIS environment.

Users who have the basic need for creating a sediment budget, but do not have access to ArcMap© or a variety of geospatial datasets, can use the standalone version of SBAS to create budgets. If at any point a user upgrades to the ArcGIS©/ArcMap platform, Alternatives in the SBAS-standalone can be exported as ArcMap© ready shapefiles. Whenever the user saves an SBAS file (.sbs), the (.sbd) file is automatically saved using the same file name. Once in ArcMap©, users can add the shapefiles as layers in the Table of Contents (using the "Add Data" tool) and load the Alternative, *.sbd file (using the Alternative Tool from the SBAS-A toolbar).

Sediment Budgets created with SBAS-A can also be displayed in SBAS-standalone. Sediment Budget layers (fluxes and littoral cells) created in SBAS-A can be imported in SBAS-standalone with the "Load ESRI Shapefile" tool. Also, whenever the user loads an *.sbs file, SBAS automatically loads the corresponding *.sbd file. The saved Alternative (*.sbd file) must also be loaded into SBAS-standalone before cell and flux values can be viewed or edited for the imported shapefile layers.



In SBAS-Standalone, Alternatives can be exported as a shapefile.

REFERENCES:

- Rosati, J.D., and Kraus, N.C. (1999). "Formulation of sediment budgets at inlets." Coastal Engineering Technical Note CETN-IV-15 (Revised August 1999), U.S. Army Research and Development Center, Vicksburg, MS.
- Rosati, J.D., and Kraus, N.C. (2001). "Sediment budget analysis system (SBAS): Upgrade for regional applications," Coastal and Hydraulic Engineering Technical Note ERDC/CHL CHETN-XIV-3, US Army Engineer Waterways Experiment Station, Vicksburg, MS.